Autonomy in the new economy

-Examining the roles and behaviours of the contemporary IT-developer-

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Authors: Mauritz Magnuson
Rasmus Nykvist

Thesis advisor: Östen Ohlsson

Abstract

Keywords: IT-developer, hacker, knowledge worker, motivation, autonomy, interdependence, curiosity, programmer, organisational behaviour, community of practice

Purpose:

Stepping off in the evolution of the worker throughout the 20’th century, the emergence of the knowledge worker and the explosion of the IT-sector, we have conducted a study into the behaviours of IT-developers.

Method:

We have performed a triangulating study where we considered the autonomy, interdependence and curiosity of the developer as relating to motivation. Furthermore we have expanded this enquiry into the cultural dimension through applying behaviours typical of individuals adhering to hacker culture. Finally an explorative study based on the results provided further insight into the IT-developer.

Conclusions:

We found indications that the IT-developer is fundamentally of an autonomous nature and that the primary technique available to managers is the communication of goals common to the entire organisation. We also found indications that curiosity is a primary motivator of IT-developers and that their connection to an extended community of practice is a great asset to any organisation. Lastly we found indications that the role of the IT-developer is currently at a crossroads where the older hacker-minded developers are being supplemented and, in places replaced, with ordinary people who learned programming in schools rather than by experimentation.

1 Background

> "There seem to be a lot of bitter people in IT. I was having some trouble with my computer so I asked the IT guy if he could help me whereupon he tells me to log a support ticket and get out of his office" – Employee of a collection agency

What happened here? Apparently our interviewee did not anticipate the autonomous nature of IT workers. Seeing Sweden as a country that is highly dense in IT workers it is important to understand their nature, which seems very dependent on autonomy. Understanding their need for autonomy grows even more important when considering that a lack of autonomy seems to seriously hamper their productivity.

How this autonomy works to create the role the individual it-developer takes in the workplace will be discussed from a historic perspective, first from the workers point of view, and then from the hacker's. When looking into the hacker subculture we ask ourselves how a possible involvement with this culture might have affected developers in these work roles.

1.1 The loss of autonomy during the industrial revolution

During the middle ages, the first steps in urbanisation led to collectives of traders and craftsmen into guilds. These served to guard the accumulated knowledge of their members and police the economic activity in which they were active (Rider 1999).While later the states would exercise less control over their subjects, the workers in a way lost a lot of the perceived freedom they had enjoyed with the guilds with the coming of the industrialisation. In the introduction to his disputation Smith (1959) looks at the United States in the middle of their industrial revolution. He found that: *"The losses of the industrial worker in the first half of the century were not comfort losses solely, but losses, as he conceived it, of status and independence. And no comfort could cancel this debt."* (p. x) Before the revolution individual craftsmen had sold their *products* in different markets but with the revolution the worker instead "came to sell his labour, he sold himself" (p. xiv). Smith exemplifies this degradation in status by quoting New York *State Mechanic, (*September 10, 1842 in ibid p.xiv) when they complained that: *"The capitalists have*

taken to bossing all the mechanical trades, while the practical mechanic has become a journeyman, subject to be discharged at every pretended 'miff' of his purse-proud employer"

The father of all theories on workplace behaviour can be seen as an integral part of how this industrial revolution further developed in ways that diminished the workplace autonomy. With "The Principles of Scientific Management" (Taylor, 1911)a scientific approach to make the factory workers as efficient as possible were argumented for and applied. To start with, the input of the workers were only their time, and the output was the money they gained. This can be seen as leading to a further reduction of the autonomy with which the factory workers could choose how to complete their work tasks.

Far from all theoretical perspectives refused to see the lack of autonomy as a problem however. Most notably Karl Marx criticized the development when he started by pointing out that the modern industrial worker in his work role becomes alienated from himself (Marx in Blauner 1964). He works only to prosper when he is not at work. Blauner (1964) criticises Marx, here presented in a simplified form, by positing that one cannot generalise “the industrial worker” since there is an enormous diversity in workplaces and the roles any one industrial worker might have. One of the more theoretical examples Blauner introduces his criticism with is how Emile Durkheim, in answer to Marx’s arguments, started developing theories that instead posited how modern society began to create fellowship among workers by letting them participate in “industrial communities” which serve to motivate them. That is, not only by paying them, but also through the inclusion in these communities. This was, Blauner argues, further developed by Elton Mayo, who spoke of “informal work groups” and how to motivate workers is dependent on a whole slew of factors besides money.

1.1.1 Contemporary workers

In Sweden today, the knowledge worker is quite common. When looking at the non-manual workers they might still be regarded as selling themselves as a human resource but the loss of autonomy that the factory workers experienced during and after the industrial revolution has in a way reversed since then. In no way are today's white collar

workers going back to the pre-industrial apprenticeships but rather the industrial revolution started a reform of the organizations into *"large-scale, specialized, and segmented organizations, with defined employee roles and responsibilities"* (Suave, 2007 in Carleton 2011). A major part of the work-force in developed countries such as Sweden are now within these defined roles and responsibilities starting to work more and more with knowledge intensive work. Today they not only work with knowledge but also, to an increasing extent, work to produce this knowledge. This leads to the emergence of the knowledge worker as a more and more vital part of today's workplaces.

Blauner not only spoke on how the work places *were*, but also on how they *were going to become* diverse. In today's IT-society the vast array of competencies that define workers has evolved and the theories on informal work groups have developed into theories about communities of practice.

1.1.2 Toward integrated environments

Hara & Schwen (2006) define communities of practice as "groups of professional practitioners" (p. 4), they furthermore characterise them as acting to *develop shared meaning* through channels such as *informal social networks*, a *supportive culture* and as consistently *engaging in knowledge building* (p.4 - 5).

The community of practice as a working unit, according to Wenger & Snyder (2000) might trace their roots to the guilds of old. In general a community of practice is comprised of "people informally bound together by shared experience and passion for joint enterprise" (Ibid, p.1). Activating communities of practice in a business context awards the following value-added activities according to the authors. They *help drive strategy, start new lines of business, solve problems quickly, transfer best practices, develop professional skills* and *help companies recruit and retain talent* (Ibid p.2 -3).

Lack of autonomy and freedom is still of great interest and might account for the behaviour of workers. Autonomy as a concept is however complicated by the relations to, or interdependence with regard to other individuals and groups of individuals.

1.2 The hacker

1.2.1 Origins and definition

The etymology of the word “hacker” is hard to trace but seems to have had three different origins depending on the form a successful “hack” would take. Firstly, hobby hacking can be traced to radio amateurs of the 20’s and from there, through the electronics community to copyright breaching of the 80’s. This would constitute hard- and software hacking. Secondly, academic hacking origins within the MIT model railroad club of the 50’s where a technology-based pranks constituted a “hack”. This was extrapolated to exploitation of technology in general, which is the proper definition of a hack even in modern times. Lastly, network hacking traces its origins to “phreaks” who exploited analogue telecommunications equipment (Löfgren, 2000). Note that the work “hack” in the sense of gaining unauthorised access to systems is not intended to be followed here, such access is merely the result of a malicious manipulation, or “hack”, of the system.

Therefore, although hackers are today primarily discussed within the context of malicious applications of their knowledge, that is computer crime, hackers themselves are divided on the subject. One should make a clear distinction between black-hat and white-hat hackers where the black-hats represent the criminal element and the white-hats are composed of hackers attempting to secure vulnerable systems from attack. The differently coloured hats are derived from 1970’s era western movies where the hero would typically wear a white hat whereas the villain wore a black one. The distinction might be traced to the game crackers of the 1980’s whose illegal activities served to divide the culture along lines of legality (Goldberg & Larsson 2011).

Accordingly, in order to keep the definitions clear, hackers will be discussed using the original definition of a hacker as someone who experiments with hard- and software in order to have them perform in creative ways.

1.2.2 The curious loner

Common to all hackers is the exploration of computer systems in particular, to have them perform in specific, and often unexpected ways. There seems to be an obsession among

hackers to test the limits of the technology at their disposal and to do so with complete disregard for any disruptions this might cause other users. Or as Levy (2001) puts it "touch the machine, start flicking switches and noting responses, and eventually to loosen a screw, unhook a template, jiggle some diodes and tweak a few connections".

The stereotypical image of the computer hacker as someone who spends time alone in front of the computer without social interaction other than that offered by online compatriots seems quite widespread. Consider the behaviour exhibited by Bob Saunder when asked by his wife if he "would like to bring in the groceries", to which he answered "no" (Levy p. 38). That is, he would of course do as she asked, but would not like it. There is a distinct possibility that this behaviour was shaped by the machines he worked with on a daily basis, which only understand instructions literally. But one must however account for the possibility that that people who prefer literal interpretations of instructions gravitate towards the machines that understand and appreciate these.

Whether IT-developers constitute a hacker or not, hackers are interesting as a frame of reference when studying the developer in the workplace. Autonomous and curious in the extreme, beyond the obvious computer connection, studying hackers could serve to broaden the perspective and deepen the insights granted by this study.

1.3 Important concepts

"Since the knowledge worker's worldview is constantly reshaped, their mental models are continuously renewed, enabling a fresh perspective that frees him/her of old paradigms that are no longer useful" -Carleton (2011), explaining Senge (1990)

1.3.1 Mental software and framing theory

Carleton's quote serves as motivation for studying different "mental models" in knowledge workers. These mental models might explain "the structure of norms, informal and formal rules, which guide the behaviour of its members" (Blauner p.25) and as such we seek to apply this theory in order to establish a frame of reference.

Working with information all the time inevitably has consequences on the way the knowledge workers interpret the world. The above explanation of Senge (1990, in

Carleton 2011) suggests that their worldview is continuously changing as a response to the new information. When the workers start framing the world differently this will affect the way they intend to act in different situations.

The concept of workers framing will be interpreted as posited by Lindenberg (2007). The use of the concept adopted in this essay comes from the framing theory but will be applied in its simplest form. Basically we see a psychological frame as a way in which, someone at a given or extended amount of time, an individual interprets the world. These frames not only say how the individual interprets the world but also what his intended actions will be.

1.3.2 Collective and individual intentionality

Many of the concepts adopted rely on understanding how intentionality in individuals works. In order to clarify this and to also take a theoretical stance we will here explain the distinction between individual and collective intentionality proposed by Searle ("Collective Intentionality", 1990). He makes a clear standpoint that "society" and hence the sum of what we could possibly measure "consists only of individual minds in individual brains". This is important and at first glance it would leave no room for the existence of any collective intentionality. In this essay he does however continue with an example making this possible after all:

Jones and Smith are making a soup together. Their personal intentional attitudes might be:

Intentional attitude (Smith): *"We are making the soup by means of me pouring"*

Intentional attitude (Jones): *"We are making the soup by means of me stirring"*

In this example we will see the individual acts as parts of the collective act of both of them making the soup. Jones intention to stir is part of his intention to (together with Smith) mix the soup together. Their individual minds have in this view by no means created an external collective intention; namely the collective intention "we are making the soup together".

1.3.3 Freedom as a human condition

In Leviathan (1651) Thomas Hobbes discussed the relationship between society and the individual. While unregulated - he argued - society would exist in a dystopian "state of nature" where every man was to fend for himself. In such a state everyone had the right to do anything they wanted, which would lead to a war of all against all. He argues that it would be better to develop asocial contract, creating a society in which one would give up select aspects of their total freedom in exchange for others in this society giving up this freedom as well. By looking at freedom in this sense he is using a negative definition of the term freedom, where freedom is the original state and any other position than this total freedom is an obstacle to it.

In Marx's example, where he means that work creates alienation (Marx in Blauner 1964), he will instead use the term freedom in a positive sense. In very generic terms he means that by limiting the freedom of the capitalists the state can *create* freedom for individual workers, giving them more options than they would have without these rules. In this case freedom is something that can be *created*.

In addition to these uses of the concept the way the term was central to Jean-Paul Sartre (Flynn, 2011) and his philosophy is of interest. What we will bring from his philosophy is to see man as in himself free, and with a need for freedom. *How* he uses the term is here of less important than how this need for freedom acts as a motivator for many of the intentions driving the individuals. The implications of this on the hacker culture will be discussed later, although the use of the term will differ from the way Sartre himself applied it. In this essay we will discuss freedom in its negative definition in the same way the hacker culture does when the say "free as in freedom, not as in beer (Williams 2002). That is, we will assume that human beings are fundamentally free to do as they please. They are however hampered in their pursuit of freedom by the creation of contracts by states (in hacker culture by laws limiting the freedom of information) that impose negative obstructions on them. The positive concept in this thesis will instead be the "personal autonomy".

1.3.4 Personal autonomy

Returning to Marx thoughts about lack of autonomy in one's work leading to alienation of the worker, the discussion on personal autonomy grants a deeper understanding for the subject. The introductory discussion states the following, "we don't want to be alien to, or at war with ourselves; and it seems that when our intentions are not under our control, we suffer from self-alienation". The pursuit of freedom is thus regarded as a pursuit of a perceived control over our actions. If any one individual has the intention to commit to an action – whether it is collective or individual as these are regarded as one and the same – and it cannot be performed, the individual will regard himself as not being autonomous.

When regarding freedom in its negative sense, as something constraints is imposed upon, autonomy is something positive that can be possessed. Can be in possession of freedom for one's own actions and therefore be autonomous.

Our view on collective intentions as being individual intentions but perceived in a collective way leads us to regard both collective and individual intentions as equal. Furthermore, our view on freedom will influence how this thesis deals with personal autonomy.

1.3.5 Curiosity

In an article looking at the history of the concept of curiosity, George Loewenstein (1994) developed an account interpreting it as a cognitively induced deprivation that arises from the perception of a gap in knowledge or understanding. This concept is in turn expanded by Harrison (2009).

1.4 Research question

Following the background a need for studying the role of autonomy further has been further motivated which leads to the overarching research question:

1. Determine how autonomy in interaction with motivation, curiosity and interdependence affects the behaviour of contemporary IT-developers.

In order to get a good view of this the following questions must be answered:

2. How can these behaviours be explained by the role the individual worker adheres to?

To research this, theories on knowledge worker behaviour and motivation will be examined in detail. Central to this literature, as will become obvious is the motivational theories as applied to the individual knowledge workers.

3. Is it possible that adherence to a hacker culture might serve to explain these behaviours?

Here the theoretical frame will be based more on theories on how to measure culture and do a proper discourse analysis as will also be explained further on.

As for answering all three of the questions our strategy involves determining the relations described in these questions by performing a multi-tiered enquiry into the matter. We believe that the subject is complex enough to warrant a triangulation through multiple methods in order to identify a specific enough approximation of reality to give an adequate answer.

1.5 Disposition

From here on the study will be presented according to the following disposition.

Chapter 2 – Framework: This section will involve all theory that will be applied both in carrying out our three empirical studies as well as theories used for the analysis.

Chapter 3 – Method: This section will describe the methodological choices we have made and give an explanation for how data was collected and treated in the study.

Chapter 4 – Material: In this section we will relay our findings from the field study and address the particularities that our analysis will be based on

Chapter 5 – Analysis: In this section we will analyse our findings and attempt to answer our research questions.

2 Framework

This section will provide the theories that will be applied both in carrying out our three empirical studies as well as theories used for the analysis.

2.1 General theories on motivation

When it comes to motivation the following theories give different frames from which the individual bases his actions on.

There are several different theories about motivation, and at least as many summaries of these. We have used the chapter on motivation in "Organizational behaviour and work" (Wilson 2004) to assess how motivation has been seen in the management literature. The probably most common theory used to explain motivation on the workplace is the hierarchy of needs by Maslow (1943, in Wilson 2004). In the case of this theory we take a stand against using it based on the fact that it is not only an oversimplification of the forces driving motivation, but it is also creating an artificial layer of some forces being more important than others. A thorough criticism can be found in Wilson (2004, p. 146) and it is best summarized in this quote: "Linstead (2002) argues that Maslow's theory is kitsch (defined as worthless pretentiousness)" (ibid. p.146).

Following Maslow the theory of Herzberg (1968) has had a big impact on the literature as well. The important factors to consider here is that "Herzberg's theory suggests that a job should enhance employee motivation to the extent that it provides opportunities for achievement, recognition, responsibility, advancement, and growth in competence" (ibid. p.148). In explaining these factors Wilson takes up some complementing studies showing a difference on how these factors contribute to white-collar and blue-collar worker motivation, which is also implicit in the other theories we have been in contact with.

The "need for achievement" theory (McClelland et al. 1953) states that the need for achievement will increase the motivation for a specific task. Achievement is defined as "a process of planning and striving for excellence" (Wilson 2004, p. 150). The main

statement of his theory is that the more that individuals' have a need for achievement, the greater the economic growth. A related theoretical framework, furthermore constructed in order to translate into quantitative research by Janz and Colquitt (1997) motivates us to research knowledge worker motivation.

2.2 Applying a model to the developer

Here we will give an explanation for the model used in an attempt to quantitatively measure and explain the behaviour of IT-developers. The model is summarised graphically below.

2.2.1Motivation is the output

In order to measure behaviour, several researchers have adopted a statistical approach using questionnaires distributed to several organizations that are intensive in knowledge work. What these models have in common is that they all relate to motivation. We will use motivation as a third order expression of utility as it has been strongly associated with efficiency (Janz & Colquitt 1997) In this section we will account for some of the most prominent of their theories and show how these have served as a foundation for our own statistical model. We will also present how the different items and constructs have been chosen.

First of all the measuring of job motivation in a knowledge worker perspective have been measured with different constructs. Janz & Colquitt (1997) uses internal motivation and growth satisfaction. Huang (2011) instead uses autonomy, significance and learning as measuring motivation. As there are a lot of similarities between the two we decided to include internal motivation from Janz & Colquitt and the significance and learning motivation from Huang.

The item measuring internal motivation bluntly asks the respondent if his/her self-confidence rises when achieving on work and can be interpreted alone. The significance construct measures, through implying a sense of urgency, the significance that the worker ascribes to himself in performing his tasks. That is, how important he is for the smooth running of operations. Learning motivation is tested through items asking if it is possible

to learn new things in ones work and if it is needed to continuously update ones professional knowledge. In addition to these constructs we left a free space where we asked the respondents to define and rank three factors motivates them at work.

2.2.2 Autonomy and interdependence

Autonomy together with interdependence have proven to be linked with high levels of task motivation (Janz & Colquitt 1997). Additionally Janz & Colquitt (1997) come to the conclusion that the positive impact of autonomy and interdependence cancel each other out. Interdependence is a trait both supported in our background theories on motivation and in earlier studies using similar statistical surveys as ours. It can be defined as "a general sense that team members must depend on each other at work" (Wageman 2005, in Janz & Colquitt; 1997).

Being two of the most important characteristics determining motivation in knowledge workers, interdependence and autonomy have been explored with statistical models. Both are strongly correlated to motivation and the relationships that they are determining are present in most literature on motivating knowledge workers (Carleton 2011, Huang 2011). When examining this relation, Janz and Colquitt (1997) found that autonomy and interdependence interact in a specific way to create motivation. Both compared with motivation themselves strongly determine the motivation of knowledge workers, but when both interdependence and autonomy are high the effects are not cumulative. He also recommends further research to look closer at this specific relationship.

In measuring the autonomy of the knowledge worker Janz & Colquitt (1997) used four different factors of which we have adopted three; autonomy in terms of "product", "planning" and "process". The product category reflects how much the worker himself can make decision concerning the product or services he works with. The planning reflects how much influence the worker has in influencing planning the work and training needs of his team. The process reflects the influence that the individual has over what methods should be used in the work process.

The large amount of workers in very small companies made some of the questions hard to copy straight off. The category "people" used by Janz & Colquitt was not adopted

because it more reflected workers in bigger organizations. Furthermore this category implied that the responder would have managerial powers of hiring and firing, something we saw little application for. The same can be said about the "planning" category that looked at the role of deciding for the team. In a very small company everyone will by definition be involved, and the reasons for and against this would be different than in teams in big companies. Our solution here was to instead let it reflect the workers influence on planning their own work and training needs. In addition a generic item was taken from Huang (2011) that acts as a catch-all for the above categories in simply asking how much control the worker has of what he does on his workplace.

Janz & Colquitt (1997), Van der Vegt (1998) and Lin (2010) all use interdependence as a predictor for motivation and use the three smaller constructs; task-, outcome- and expressiveness interdependence to measure it. Outcome interdependence is "the degree to which organizational members are presented with organizational goals and provided with organizational feedback and rewards" (Neubert, Taggar, & Cady, 2006 in Lin 2010). Task interdependence is "the degree to which organizational members count on and interact with one another to perform their tasks" (Neubert et al., 2006 in Lin 2010). Expressiveness interdependence is "derived from expressive ties that stand for interpersonal friendship and social support" (Manev and Stevenson, 2001 in Lin 2010).

The issue of lack of cumulative effect will be further explored in interviews. Based on earlier research we know that this relation has been proven for knowledge workers in general, we are thus applying it to IT-developers. Furthermore we explore how a hacker culture is affected by and handles the above, possibly from the viewpoint of a Community of Practice. That is, how autonomy from co-workers and the organisation relates to interdependence with a community of practice, in this case the hacker community.

2.2.3 Curiosity

Both the hacker and the IT-developer should be curious as this serves to seek new knowledge and update the knowledge one possesses. This should, per definition lead to

motivation towards the seeking of knowledge. Also it should lead to the application of spoken knowledge and thus higher levels of productivity.

Harrison (2009) approaches the concept of curiosity by measuring two specific dimensions. The first of these is the information seeking and positive framing dimension suggested by (Ashford & Black 1996, in Harrison 2009). The second dimension, measuring dispositional curiosity, is composed of two subcategories, specific and diverse curiosity. Specific and diverse curiosity both lead to motivation through framing the goals of information seeking in a positive way. It is therefore of interest to see which of these shows the stronger correlation, and if both types do.

First, we adopt the "information seeking and positive framing" dimension suggested by (Ashford & Black 1996, in Harrison 2009) and use the questions directly. The second dimension, dispositional curiosity, is composed of two subcategories, specific and diverse curiosity. These are measured according to pre-developed scales (Litman 2008, Litman & Jimerson 2004, Litman & Spielberger 2003, in Harrison 2009). The authors adapted one question to convey a stronger emotional connection than the original did.

As an extension to this we also approach our interviewees on their curiosity where we seek to have them specify how and what it is composed of. We also seek to explain if and why the "hacker" is a curious being.

2.2.4 The model visualised

Our model can be visualised as follows, the authors who have previously researched connections within it are represented along the relationships they have researched. The query marks represent relations that will be explored qualitatively in our interviews.

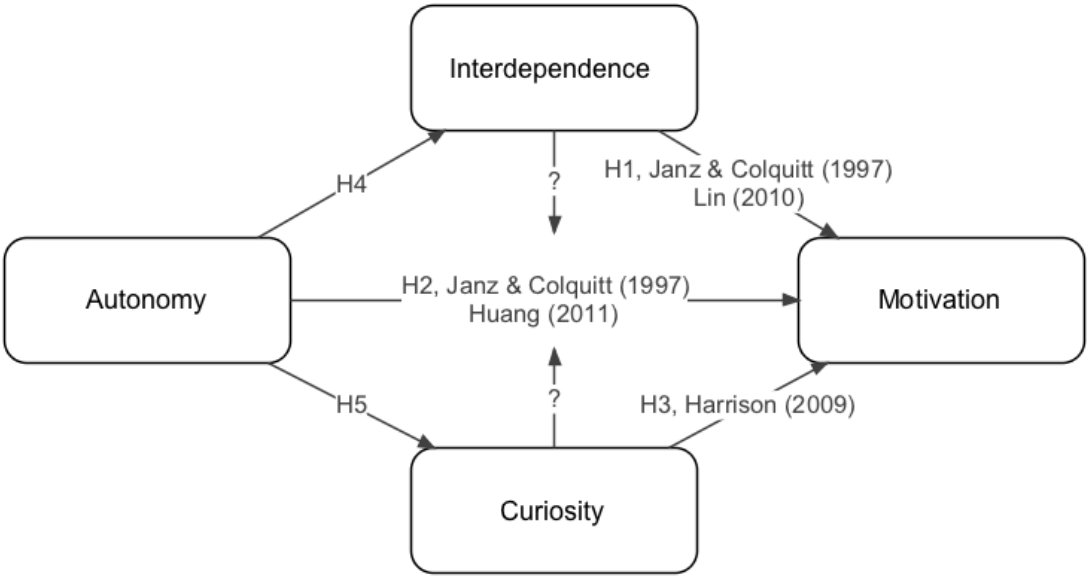

Figure 2.1 – Relational model of constructs

2.2.5 Hypotheses

From this theoretical background we formulate the following hypotheses to be tested through statistical analysis.

H1 :: There is a positive relationship between different levels of interdependence and motivation.

H2 :: There is a positive relationship between different levels of autonomy and motivation.

H3 :: There is a positive relationship between different levels of curiosity and motivation.

H4 :: There is a positive relationship between different levels of autonomy and interdependence.

H5 :: There is a positive relationship between different levels of autonomy and curiosity.

2.3 The cultural study

In order to give a good picture of the cultures shaping the workplace role of the it-developer an open ended approach with several sources of empiric data was chosen. The two main ways in which we will gather empirical data, a literature study on the hacker culture and interviews with different it-developers are done in line with ethnographic studies as outlined in Hatch (2002). As a theoretical complement parts of the framework for extracting meaning from cultural observations suggested by Schein (in Hatch, 2002) was adopted and applied to our theoretical sources. After accounting for the theories on which our method is based, we will discuss earlier theories and observations relevant to our study.

2.3.1 Interpreting cultures

The references to framing theories used in this study do not study culture per se. In order to paint a more complex picture of these cultures the chapter on culture in organizations in Hatch (2002) We will start with the very popular framework for cultural analysis developed by Schein (Schein, in Hatch 2002) and by adding other frameworks in the end connect the analysis to the framing theory perspective.

Schein's model for cultural analysis (Hatch 2002, p. 242 - 247) states that each culture has its own set of basic assumptions. The assumptions are very fundamental constituents of the culture. At a more general level the cultures are built up by norms and values. Just like the fundamental assumptions neither the norms nor the values can be directly observed. The only thing that we can outright observe are what Schein calls artefacts. Artefacts encompass physical manifestations such as art, fashion and design. Behavioural manifestations like ceremonies and rituals, and also rewards and punishments. Lastly it encompasses verbal manifestations such as anecdotes, jokes and jargon; tales, myths and history; and also heroes and villains (Schein in Hatch, 2002). One way to approach these artefacts with a scientific intention is to see them as symbols. This is what Geertz (1973, in Hatch 2002) does when he sees them as "associated with a larger concept or a wider significance" (Hatch 2002, p. 250) in order to explain the culture's particularities.

Towards the end of the chapter Hatch (2002) states that one of the best ways to study the above mentioned artefacts and symbols would be an ethnographic study relying on observation and interviews (Ibid p. 252 - 257).

We will use the above interpretation of the theories as our approach, but we will almost exclusively limit our effort to identifying behaviours in different individuals and then directly theorize on how these can show the particularities of the studied cultures. By ourselves interpreting how to identify the behaviours with these established theories as a foundation this will make it easier to triangulate this part of the study with our survey and earlier research on the workplace behaviour of the knowledge workers.

2.3.2 Freedom and participation

When looking at more applied studies of sub-cultures similar to the one we study, Benkler (2006) again is a good source. In extension to the basic theories, Benkler (2006) devotes an entire chapter in The Wealth of Networks to individual freedom, Autonomy, Information and Law. Here he concludes that, due to the decentralised and non-proprietary nature of information technology, the participants are now a part of information production. It follows that they are attaining higher degrees of freedom than previous passive consumers.

In the case of the hacker real world interaction is less frequent as a lot of their time is spent trying to solve very hard technological problems, rather than social ones. While taking an active role in the hacker culture the interaction and confirmation of your place in this community is often communicated through a computer rather than by meetings in real life. This special form of communication, the role of the special way of relating to technology and the extreme meritocracy inherent in the hacker culture are all characteristics that could have a bearing on how the individual IT-developers work in the organizations. Due to this complication, we must retreat from the pure study of knowledge workers and consider what motivates the hacker before attempting to concatenate these into a category influenced by both sides (Goldberg & Larsson, 2011).

2.3.3 Entering the meritocracy

Michael Young popularized the word "meritocracy" in his "The rise and fall of meritocracy" (1958). Writing in the form of a satire of the modern society he starts in the 1870s by following the socialist movement in the United Kingdom. He then continues on how it helped create a society where merits and intelligence rather than heritage determines social status and who gets to work in positions of power. The notion that how smart you are and what you manage to achieve, is strongly represented in the hacker culture. In the hacking community you are what you know and what you have done, in a strict hierarchy. While Young looks at the societal level and postulates the thought that by measuring the intelligence who gets to go to a certain school is determined, newcomers without merits in the hacking culture are expected to work hard on their own accord in order to catch up to the more experienced (Goldberg & Larsson, 2011, p.71). You need to show determination and a genuine interest for hacking, and in reward the more experienced and knowledgeable can elevate themselves to whatever position they like (Ibid, p. 271). As Levy defines it in his hacker code of ethics “Hackers should be judged by their hacking, not bogus criteria such as degrees, age, race or position” (Levy, 2001, p43), which is further explored by Philip Pettersson “You are judged by your merits, not by your looks or the amount of money you have” (Goldberg & Larsson, p.72).

We have already, in the quantitative model described a set of factors acting on the motivation of Knowledge workers. When reviewing the literature on hackers, these dimensions will work to determine the behaviours we seek to describe.

2.4 Methodological considerations

2.4.1 Multiple Method approach

First of all, any attempt to combine quantitative and qualitative research methods will create problems. The argument Bryman (2011) takes from Smith (1983) saying that the different methods have different fundamental epistemological and ontological values is very important and needs to be addressed. In addition to this some researchers (Guba, 1985, Morgan 1998 in Bryman, 2011) have gone as far as saying that they are part of different paradigms (Bryman, 2011 p.556). Bryman does however state that they do

overlap and have some common elements. We do not consider these criticisms against multiple methods negligible and will address them.

The main idea throughout the essay is some form of atomism with small observable behaviours that can be measured and generalized to give a coherent view on the studied objects, the individual IT-developers. When applied through the statistical model this is very obvious in that we use a clearly defined language developed by a scientific community to ask the subjects about their attitudes and behaviours. The validity of the model and our hypotheses rests on how well the research community functions and it is not up to this essay to question it further.

When it comes to the open questions and explorative cultural analysis a constructivist perspective is almost impossible to avoid. Strauss (1973 p. 308 in Bryman 2011 p.36) as a proponent of this view analyzed the formal and informal rules that constituted the interaction between the different actors in the workplace and identified hidden norms as something that was constantly re-negotiated. In the organizational context the fact that these rules are always being re-negotiated leads to a view that the organizational culture is not something constant but rather something constantly changing as well. In carrying out interviews and doing the literature review this can somehow be accounted for, but to study these phenomena with a survey is harder.

2.4.2 Our own point of view

In addition to the problems associated with using multiple theories the reflexivity of our essay needs to be considered. This is because both of us to some degree, one more than the other, are insiders in the hacker, IT-developer and knowledge worker cultures that has been discussed. In light of us carrying out an anthropological study this is thoroughly discussed in Davies (2008) who puts emphasis on the insider/outsider perspectives. Here an insider is someone who is using the same frame to interpret the world as the culture in question. In our context this would make us somehow insiders in the hacker-culture to begin with giving us a higher understanding for the culture, but also limit the objectivity - of our observations (ibid. p. 67-94).

3 Method

This section will describe the methodological choices we have made and give an explanation for how data was collected and treated in the study.

3.1 Reflexivity and additional empirical evidence

In addition to the three main methods this approach led us to also refer to our own experiences as insiders in the hacker culture as empirical facts of value. The same can be said for one of us who now and then works as an it-developer. During the process a few participatory studies where we just spent time with friends or colleagues while they were working. A lot of observations were made but not in a structured way. This was not the main part of our study but helped in the triangulation process, why the results will only sparsely be referred to.

3.2 Statistics and how to measure them

In this section we will relate the basis upon which our survey was constructed, our data sources and the proposed method for analysing this data. The full list of items used for the different categories can be found in appendix. 2.

3.2.1 Developing the constructs

The model is comprised of four constructs, each measuring a specific dimension. Autonomy, Interdependence and Curiosity have been identified as possible precursors to motivation and so each will be measured through questions sourced from previous research on the subject as declared when discussing the model above.

3.2.2 Sourcing the data

The survey was entered into an online survey tool from which links were distributed to a number of companies and a few individuals identified as working as or with IT-developers. In the end only the ones who saw themselves as developers were used. We

estimate that the audience intended was composed of 110 individuals of which we recorded 37 replies. This leads us to conclude a rough response rate of 34%.

3.2.3 Treatment of the data

The data was analysed using SPSS statistics. As temporal resources and the number of observations did not allow for a full SEM model to be constructed, we instead chose to use a similar treatment as Janz & Colquitt (1997) using single and multiple linear regression between constructs in order to establish or refute the presumed relations.

In order to determine the relations we specifically observed the regressions' level of significance and their beta-values as the first would explain whether the relation was pertinent or not and the second as it explains the degree to which the independent variable explains the dependent.

3.3 The cultural study

3.3.1 Hacker literature

Four contemporary works on hackers, according to different definitions were reviewed as part of this study. These works are biographies and compilations biographies, written by journalists for the general public, they are listed below with their respective authors.

Svenska Hackare. En berättelse från nätets skuggsida	Daniel Goldberg & Linus Larsson
Hackers. Heroes of the computer revolution.	Steven Levy
Free as in freedom. Richard Stallman's Crusade for Free Sotware	Sam Williams
Steve Jobs - en biografi	Walter Isaacson

These were chosen for the following reasons. The first book was chosen as it covers the comparatively younger Swedish hacking community and gives an overview of hackers' behaviour in modern society. The second book expands on the history of hackers in the

environment they first emerged and evolved. The third book details the life of a prominent proponent of free software who also is counted among the original hackers of MIT. The Fourth book sought the business applications of the hacking mentality, it proved though, to be more confirmative of Levy's work and the review was thus discontinued at an early stage.

3.3.2 Other sources

The authors have also frequented several blogs, forums and chat rooms, even before this study was commenced. Furthermore we have several acquaintances in the IT-community who exhibit varying degrees of hacker mentality. The collected experiences from these media are recounted as personal experiences and thus represent an insider perspective.

3.3.3 Extracting what's important

The material was reviewed using ethnographic content analysis as described by Bryman (2011) where the initial, guiding categories and variables were the dimensions defined in our quantitative study and the behaviours defined emerged from the review.

3.4 Interviews

Based on what we discovered in our preparatory work and in the first two studies, we chose to deepen our understanding of these areas through a set of qualitative, semi-structured interviews as per the definition given by Patel & Davidsson (2003). These were conducted in a two-tiered fashion with the first tier consisting of seven explorative interviews with persons active in the IT-business. The questions consisted of open-ended questions based on our research model, issues raised in pre-interviews and behaviours identified in the hacker culture.

The second tier consisted of eight confirmative interviews where the interviewees were chosen in the same way as before. In this set of interviews we told the subjects about our findings so far and asked if they agreed or not and whether they had further comments. This stage did not significantly change the outcome but provided further insight.

4 Material

In this section we will relay our findings from the field study and address the particularities that our analysis will be based on

4.1 Statistical Findings

In this section we will account for the statistical operations carried out on our collected dataset. We will test our hypotheses and relate the outcome of these tests. As the respondents were working in companies and departments of different sizes and the samples were somehow random it was representative for the target population of it-developers in general in Sweden. Of the demographic variables controlled for, only the age was not seen as representative for the target population with most respondents being 20-39 years old.

4.1.1 Motivation and Interdependence

H1 :: There is a positive relation between different levels of interdependence and motivation.

H1 is confirmed at the 95% significance level. Interdependence explains 51.7% of variation in motivation. When broken down into its constituent components, organisational interdependence, expressiveness interdependence and task interdependence all significantly explained the variation in motivation.

Multivariate analysis of the three components with motivation as dependent only expressiveness interdependence proved to be significant at the 95% level of confidence (B=.341)

By confirming H1 it is clear that a covariance exists between interdependence and motivation. In accordance with the reviewed literature, the indication is that causality runs from interdependence to motivation. We conclude that interdependence creates motivation.

4.1.2 Motivation and Autonomy

H2 :: There is a positive relationship between different levels of autonomy and motivation.

H2 is rejected at the 95% significance level but confirmed at 90% significance, where it accounts for 32.1% of the variation in motivation.

4.1.3 Curiosity and Motivation

H3 :: There is a positive relationship between different levels of curiosity and motivation.

H3 is confirmed at a significance level of 99% and accounts for 47.9% of motivation. Under factor analysis a split of the curiosity construct into the factors “information seeking and positive framing” and “dispositional curiosity” is not supported.

From previous research it is assumed that the directionality of causality runs from curiosity to motivation. In conjunction with our correlation we can assume that elevating levels of curiosity in the individual IT-developer will lead to higher motivation.

4.1.4 Autonomy and Interdependence

H4 :: There is a significant correlation between different levels of autonomy and interdependence.

H4 is confirmed at 99% significance level where autonomy accounts for 58.7% of the interdependence. Autonomy for planning significantly (99%) predicts interdependence (B=.422) whereas autonomy for product (B=.332) and process (B=.337) predicts interdependence at a 95% significance level.

When put together in a multiple linear regression, autonomy for planning alone is significant at a significance level of 95% (B=.340).

Unlike the other hypotheses no evidence of the directionality of causality has been identified. This shows that high autonomy could be used to predict high interdependence, and vice versa.

A scatter plot shows two visible clusters, one on the lower end of both scales and one distinctively higher with almost no cases in between.

4.1.5 Autonomy and curiosity

H5 :: There is a positive relationship between different levels of autonomy and curiosity.

H5 is rejected at 99% and 95% significance level, at 90% significance we can confirm the hypothesis. Autonomy does however, only account for 32% of curiosity.

Multiple regression shows that among the components of autonomy only autonomy for planning is significantly (95%) related to curiosity where it explains 36.1% of variation. The other components are not significant at any level.

4.1.6 Visualisation of results

The following image shows the relations researched and our findings.

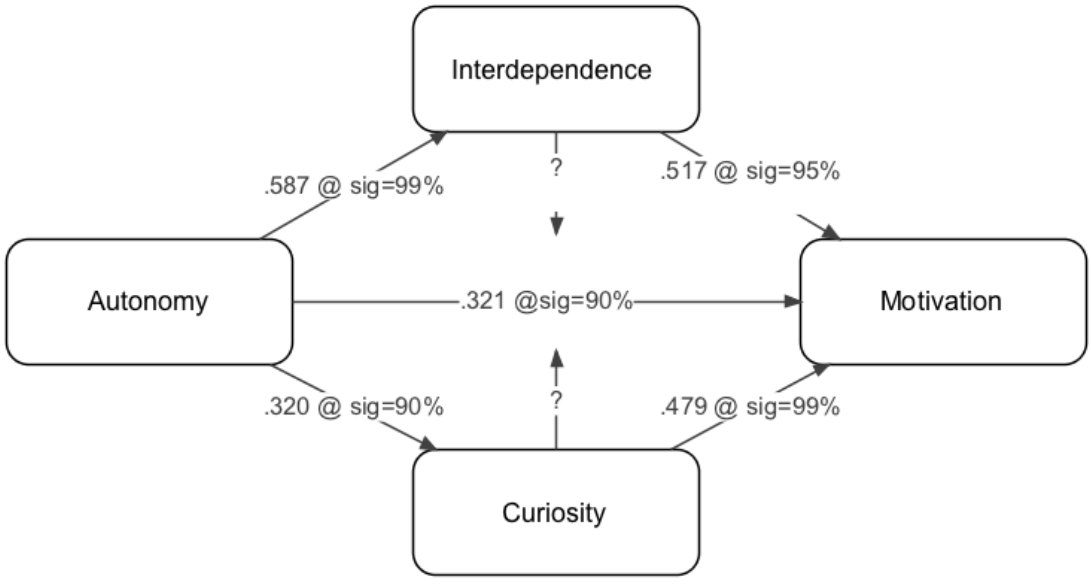

Fig 4.1 – Relational model with findings

4.2 Cultural material

4.2.1 Hacker autonomy – To be free

"Free as in freedom, not as in beer" –Richard Stallman

From the literature we gather that hackers basically regard themselves as being free in regard to technology and within this context rules and laws do not apply to them.

Early hackers' quest for access to technology and the unorthodox methods early hackers would apply are quite well illustrated in how the hackers of the MIT model railroad club went about their business when acquiring needed parts for their experiments. Under the name of the Midnight Requisitioning Committee, members would raid storage areas for electronic components; never once reflecting on what they were doing was stealing (Levy p. 40). In fact such behaviour would be viewed as simply the act of exercising a measured amount of discretion in order to solve a problem.

One could infer that such acts would be viewed as a misappropriation of university property, and although the author does not elaborate on the subject one must account for the possibility that the requisitioning committee must have come under some amount of fire from MIT staff and management. However viewed in the light of a cultural phenomenon it is likely that this blatant disregard for authority has lived on.

From one perspective one may regard the concept of freedom as related to software in the historical perspective. During the 50's at MIT, hackers would keep a common cache of programs, on paper tape, in the desk drawer beside the terminal (Levy). This cache was communally maintained and updated, representing an early implementation of open source software. As such openness was taken for granted, commercialisation of code and the closing of it to outsiders represented a significant departure from the culturally accepted norms.

With corporations limiting the access to the program code of their products there have been several more examples of counteractions against it closed. A very creative illustration is found in Richard Stallman's interaction with a software engineer from Xerox PARC. When MIT upgraded their printer, a status reporting script written by

Stallman became depreciated as the new printer had a completely different set of instructions. However in contact with the engineer responsible for writing the printer's firmware, Stallman was informed that the code was proprietary and not available to the public (Williams, 2002). Thus the proverbial free information was taken out of the loop and Richard Stallman launched on a lifelong crusade for free software. The consequences of this incident are reflected in the hacker code of ethics under the headings: "All information should be free" and "Mistrust authority - promote decentralisation" (Levy, 2001, p. 40 - 41)

The issue of open- vs. closed-source is a central issue in the hacker mind. People such as Richard Stallman of the Free Software Foundation and Linus Torvalds, the programmer credited with making the UNIX operating system available for free with the invention of Linux, are regarded as heroes. At the same time Bill Gates of Microsoft in the 1970's were viewed as a villain who appropriated code for his own profit rather than for the good of the community. Since many of the organizations we study do live off copyrighted solutions how the individual IT-developer looks at free code could potentially be important, however on the individual level the mistrust of authority and need for intellectual freedom might be even more important. In other words this might translate into the developer not wanting to take orders from just anyone but rather try to pursue their own agenda or way of solving specific problems. One way in which this shows is how many of them see no limits to how perfect what they create can become.

This suspiciousness of, and disregard for authority, seem to be a historically recurring theme. When exploring the literature on the origin of hackers one will certainly encounter the tales of the computer labs of the 1950's and 60's where machines were operated by a designated staff of technicians and operators. Stories about early hackers dwell on the subject of accessibility, i.e. the relationship between operators who ran programs and the programmers who wrote them (Levy p. 19). These operators were, at least at MIT, somewhat sarcastically called the priesthood and their trainees were aptly referred to as acolytes.

Such a system might be explained by the tendency for investors and management to keep multi-million dollar, mission critical hardware away from experimentally minded young

hotheads just in case someone might flip the wrong switch. In fact, in light of early hackers' lust for experimentation, flipping the wrong switch and causing a spectacular crash might be expected, or for them even desirable since it would offer some insight into the hardware's capabilities (Levy 2001, p. 17). The division between man and machine however frustrated early hackers who wanted hands on experience with these systems, something which would lead to specific type of practical jokes, "hacks" actually, aimed at showing the "priesthood" who was more competent.

4.2.2 What happens if I take it apart?

As per the first chapter of Levy's book, hackers in the traditional sense of the word shared a fascination for technology. Be it the switching systems of a model railroad or the experimental computer systems at MIT of the late 50's. Many of the, less than intended, applications programmers found for these early computers are not a matter of rationalising a computational workload, but rather to bend the technology to one's will. Simply put, exploring the depths of what was possible to accomplish required experimentation concerning how one were to talk to the machine. Something that becomes quite obvious in the tale of how Peter Samson managed to hijack an area of memory on the TX-0 computer in order to make it play music through the diagnostic speaker (Levy p. 31-32). In accordance the early IT-developers might be more similar to an anthropologist exploring the language and customs of a previously isolated tribe, than someone simply following the logic required to have the machine complete a set of intended tasks.

This story illustrates unconventional application of technology as central to the hacking culture. Or as Julian Assange puts it: "The hacker mentality is about thinking outside the box in a certain way, to find creative solutions to locked-in problems" (Goldberg & Larsson, 2011, p. 257).

We see a similar tendency to explore modern systems among contemporary hackers and in spite of modern systems being far more spaciously accommodated in terms of processing power and memory resources there is still a tendency to seek optimisation of these resources. Such a process hearkens back to older, more limited systems (Levy p.

26), where a few functions could be all that stood between a well performing system and a waste of processing power. The obsession with manipulating code into elegant solutions, can, according to one of our interviewees, cause considerable problems when trying to have them keep a deadline. One might argue that such optimisation and obsession with getting as much work as possible done with the least amount of resources reflect what the original hackers, or gurus, would value and which continues to this day.

4.2.3 Disregarding interdependence

One of the most prominent behaviours found among hackers is the desire to create something as efficient as possible through an extensive process of optimization. This extends as far as sometimes threatening deadlines and thus presenting it as a managerial problem. In our pre-interviews one of our interviewees put it as: “left to their own devices they cannot distinguish between getting something done on time, and getting it done well”. We can trace this behaviour historically to the code optimization of the 1950’s, which started as a necessity but became a source of bragging rights that have lived on within the frame of hacker culture.

This same interviewee also states that, within reasonable limits, hackers should be left to their own devices towards the back of the office where they are located. The issue of autonomy in relation to hackers might be better understood in the context of freedom, as it would apply to and artist. No one would reasonably question an artist's freedom to create under his own auspices; a hacker might concur and claim that the same applies to him. As being in possession of an extensive skill-set and being able to divine a solution to a problem, preferably one more optimal with regards to resources required, one could regard him as an artist or electrical engineer, an issue also raised by Levy (p.43).

This relates to the opinion that the challenge of a project is in and of itself a motivator. We relate this to our literature on hackers by pointing towards the cultural phenomenon that the first person to solve a particular problem would be regarded as the authority on this subject. Thus challenges were not only for internal satisfaction but also for gaining status and position within the community. However in a business context it rather

illustrates a problem between business functions and the hackers' tendency to appropriate a product until it is sufficiently elegant for the developer to stand by.

4.2.4 Particularities of communication

One interviewee states that the issue of lack of communications skills has the potential to cause trouble in a business context. At his company, someone had attempted to have developers in direct contact with clients, although the consequences were not elaborated on a project manager had to act as an intermediary to solve communications issues. Some developers are characterised as fulfilling the 'nerd' stereotype, complete with "no social competencies whatsoever". This, in turn, forces developers into an interdependent relation with their communications agents, something which, for one used to the hierarchies of the hacker culture might be frustrating in turn.

In this way it is illustrated that even though hackers might have the intention to act in a social manner, lack of communication skills can get in the way of others' perception of this intention. They may therefore be in possession of a helpful or empathic disposition but unable to communicate it in a socially acceptable way.

These communications issues are recurring in hacker lore, but in many cases coming from a different angle. In many such tales, told from the hacker's point of view, the recipient of the communication is described as being too stupid to understand what is being sent.

Among such hacker lore and humour, the series of articles named "Bastard Operator from Hell" by Simon Travaglia take a central place. These stories tell the tales of a rogue, and actually homicidal, systems administrator who go about punishing users he regard as being inept in most extreme ways as in the excerpt below.

"He tells me the RS232 still isn't working. I make some excuse about dry joints on the plug etc, and ask him to put a new plug on the cable. I hear the >snip!< as he clips the old plug off, and the receiver rattle as he starts to strip the wire in a manly way with his teeth. Then I connect the mains cable to my end of the RS232." (Bastard Operator from hell, #15, p.29)

Of course no systems administrator would attempt to electrocute their colleagues, but the story serves as an illustration of a longing for being able to have users respect their equipment and stay accountable for their own errors in the same way a hacker would

Whatever angle we regard this from, the communication issue seems to be a real issue but not regarded as such within the hacker community, which rather prefers to make fun of it. Whether or not this sort of meta-humour is designed to show actual disdain for non-hackers or if it is merely a compensatory projection it could be taken at face value to show a purposeful distancing from non-technical people. As such, it might be a welcome notion to a group who wants to be left to their own devices.

4.2.5 Meritocracy and mentorship

Here respect is something you earn by yourself applying technology in creative ways such as those already discussed. In addition as part of the hacking community you are supposed to find out on your own about the current state of the field of hacking you are into. This forces aspiring hackers to try every possible avenue before asking their more experienced peers (Goldberg & Larsson, p. 216) on peril of humiliation within, and possible exclusion from, the community (Ibid, p. 70, 217). The culture presumes that a newcomer should stay quiet and listen, try instead of asking and if personally offended, drop out (Ibid). This phenomenon is most aptly characterised in the expression RTFM, i.e. Read The F*cking Manual.

As one of the authors has personally experienced, it does on occasion happen that a senior member finds a newcomer interesting enough and in possession of some potential. Such a newcomer would typically attempt to learn on his own, ask only a minimum of well thought out questions and never ask someone to complete his tasks for him. In these circumstances a sort of mentor / apprentice relation may evolve. However as with most subjects hacker-related, these are laden with tests and challenges, mostly in the form of pranks.

It is in this capacity that one of the authors has found himself. When new to server administration he handed over access credentials to a more experienced companion in case he were to ruin the server's configuration and needed help. This led to two incidents,

firstly the redirection of all Internet traffic to a local web page urging him to contact said friend more often through the chat program IRC. And secondly, the implementation of an obnoxious version of greeting messages at login.

When requesting to have the server restored to the previous state the author was informed that he should do so himself if he really were serious about learning the system. This shows a sort of veiled helpfulness expressed through well-meaning pranks designed to promote the newcomers own learning. The information is out there, so read the manual and fix it, one day there will be no one around to do it for you.

Combining the meritocratic dimension with the quest for perfection and the need to explore implies a culture dead-set on not only being the first do discover new applications for technology, but also to project an aura of being exclusive.

4.3 Material from interviews

Here we will account for pertinent parts of our qualitative data in order to show what our interviewees have brought to our attention.

4.3.1 Recognition of hacker culture

When asked, a majority of our interviewees did not agree that they adhered to a form of hacker culture. Nor did the managers agree that such a culture was prevalent in the workplace. On the other hand the individual characteristics identified in the literature review have been observed to some degree. It was brought to our attention that IT-developers are divided along the lines of those exhibiting several hacker characteristics and others who have a more common personality. This was related to us as a generation shift where the older developers were the more hacker like and younger individuals were characterised as normal “university types”.

We are told that this seems to be driven by move from low-level programming languages, i.e. languages closer to machine language, to high-level ones. As high-level languages require less insight into the inner workings of the hardware and are thus both easier to learn and more portable between systems. We are told that there is no point in writing

machine language any more. Those who developed the compilers that handle high-level languages have already done that work for you.

The term hacker has thus proven too rough a measure to classify developers. The research into hacker culture has however proven fruitful in order to find certain behaviours relevant among developers.

4.3.2 Free software

When asked about free software, we were informed that most companies used a mix of free and proprietary software. Many were appreciative of, and made use of the free software community but none felt that contributing to the community was one of their primary concerns.

> Free software is software developed through a transparent process where the code is open for the general public to review. It is typically developed communally with participants from all over the world. Usually it is available at little or no cost but this is not a necessity.

"Stallman is religious" – stated by one of the interviewed systems administrators

This was voiced by one interviewee, who showed most hacker characteristics of the ones interviewed.

4.3.3 Meritocracy

All interviewees express different degrees of meritocratic judgement. We do however find that the definitions of what constitutes a merit vary with each individual. Some, for example, see education as a merit while others value experience higher. Common for most is that the tangible output is important for judging the abilities of their co-workers and stakeholders in the company.

4.3.4 Tinkering

When asked the general question "what motivates software developers", a senior project manager expressed two major points. Firstly, the developers' have an inclination towards perfecting and optimising "nice solutions". Furthermore he describes his developer's

main force as being their genuine interest in what they are doing. This is apparent in some of the interviewed developers' willingness to spend entire nights working on a project, even those who are recently employed.

A "nice solution", also programming elegance, involves optimising a solution beyond specifications. Results could entail having programs for example consuming the least amount of system resources, raising system security.

The genuine interest, in these cases goes beyond a mere working mentality but rather encompass a lifestyle revolving around IT. Implicit in many of these interviews is that these developers are acting more as if making money from a hobby. The founders of one of the smaller companies expressed the possibility of capitalising on their employees' more personal interests related to their business, even when not immediately applicable. They exemplified this by relaying their experiences in Google-like companies where a fourth of their working time was spent on personal development rather than production.

One of the companies we have interviewed reveals to us that they are trying to "launch a few cash cows so we can do whatever we want to afterwards".

4.3.5 Do not change the specs

Not to change the specifications of a job after asking the developers to do it is very important no matter the size of the organisation

The developer who is in direct contact with his customers can himself ask these for detailed specifications, see that they are realistic and correct them if they are not. Furthermore he can exercise control over whether or not they are allowed to change.

In the case of a larger company with a dedicated sales organisation, the only thing the individual developer can do is to communicate with the intermediary salespeople. In this case, changes in specifications have been expressed as a common source of frustration that sometimes leads to delayed deadlines or a lack of quality such as bugs.

In one case, the management had a high level of understanding for the technology and the coding involved. And thus, the issue of specifications being changed on the fly, was never raised in interviews.

4.3.6 Secrecy

While many of the interviewees did have strong values in favour of keeping information open and free, specifically from a management perspective they are told to keep a lot of vital information to themselves. When asked about this, individual IT-developers interviewed agreed that they indeed did not share all information, but rather finished their project and shared the result. The main reason apart from making yourself irreplaceable was that "management do not understand what I am doing anyway, so why should I keep my work open?"

4.3.7 Detachment and informal communication

In most companies we have researched, developers are physically separated from the rest of the staff. Some interviewees call this the developers' cave. Although most have expressed that they enjoy working together with others, and it is important to note that these others are developers as well.

An architect we have discussed this with relayed the following. When designing new offices with an open floor plan for an IT-company, specifications included a secluded area for the developers.

We have learned that, when working out of office, developers make sure to keep open communication channels. These channels are chat-rooms and forums in addition to their telephones. Most interviewees see this as obvious and those who did not "lurk around forums" when they were younger, got used to this when attending university or starting work.

4.3.8 Supportive IT

In some cases the IT-section serves as support function for other parts of the organisation. In our pre-interviews the issue has been raised that IT-departments are highly formalised

and inflexible in dealing with problems. They felt that they did not get the help they needed when they requested it. Instead they were asked to log a support ticket and wait.

Explained from a systems administrator's point of view, in addition to using the support-ticketing system, each co-worker was asked to break each issue down into manageable pieces. Each task for which you needed help was to be specified in detail. Also, one was encouraged to only ask for help one issue at the time, to allow the helper to prioritise on his own.

In one case we were made aware of the positive effects of splitting support and operations into two different departments allowing each to deal with their core tasks.

4.3.9 Cool stuff

"I will start with a question, if you have a spare £400 in your development budget do you A) Reward your star programmer with a £400 bonus or B) Buy him a 24 Inch 1920x1200 LCD screen?"-Nick Halstead

In his article Nick Halstead (2010) comes to the conclusion that unless a managers answers "B" he has no clue on how to motivate a software developer. While answering open questions about motivation many of the interviewees expressed a similar view. As such "cool stuff" show up as both an expression as well as a motivation for the job. It is expressed that when working with cutting edge hardware, or expensive toys, one is willing to spend yet a few hours more on the job. The conclusive answer to the posed question is hence "B".

4.3.10 Supply and demand

A senior project manager relates to us that if developers are not allowed to do their job to their own specifications, they are likely to look for a new job.

Demand for developers has lately been higher than the supply. Furthermore many, if not most, developers are highly specialised in one or several sub-fields, making them irreplaceable. This has contributed to their disloyalty towards the companies they work in.

4.3.11 Mismatched expectations

In several of the organisations included in the research that marketing sells something without consulting the IT department first. In many of these cases the product or service cannot be produced with current resources of the IT-department but it is still handed off to them as “their problem”. Conversely, IT delivers something beyond specs for current project and sometimes beyond deadline, wasting resources in the process. Interviewed managers, consultants and developers have all taken up these observations.

5 Analysis

In this section we will analyse our findings and attempt to answer our research questions.

5.1 First order analysis, the developer in the workplace

As the individual acts in specific ways in his role as a worker we have found that both the hacker culture and the evolution and diversification have influenced these behaviours to some degree. Our empirical evidence shows us that this role is enacted in several ways that we will account for.

5.1.1 Colouring our model

From previous research and our statistical model, we see that autonomy is important for keeping the individual motivated. Our interviews have further refined this to show that autonomy is actually desired in the group level. This is expressed in the form of the "developers' lair", which is commonly detached from other functions in the office. Interdependence is most critically expressed in the mismatching between marketer, developer and customer which has been shown to arise at times and which a competent consultant or project manager must bridge.

We define freedom in the negative sense, as something upon which restrictions can be imposed. As has become evident, the developer is fundamentally motivated to do his job. It is in light of restrictions that limit his freedom and autonomy imposed that may lower his motivation and thereby the utility he contributes.

One such restriction, which acts both as an obstacle and a necessity, is interdependence. Interdependence in the workplace, even though it serves to limit autonomy is vital in keeping developers on the common track and it is important to effectively communicate this interdependence to the developer. If the interdependence imposed is of the wrong type or not properly communicated, the developer will not contribute to the company. Also, just as with other knowledge workers, interdependence leads to motivation in IT-

developers as well. As such, we conclude that interdependence is about having and being aware of common goals.

It is possible to communicate such goals even quite informally. An extreme example is the open-source community where highly autonomous individuals from all over the world participate in a community of practice and carry out highly interdependent work towards a common goal. This is in alignment with Searle's soup cooks carrying out individual tasks toward a common goal.

When discussing curiosity we have found it to be an innate driving force. In the knowledge worker literature though, curiosity is not covered to the same extent as autonomy or interdependence. We propose that this measure of curiosity is what sets IT-developers apart from knowledge workers in general. This is further demonstrated by its importance to hacker culture. In our interviews this became apparent in the desire to construct "nice solutions" and the willingness to tinker with these until perfection is achieved. An instance of this is the fact that IT-developers react more positively to rewards in the form of "cool stuff" rather than the more common monetary reward, strongly indicating that the curious developer is a motivated developer.

As we know from our statistical model both curiosity and autonomy are drivers of motivation. In order to find the relation between these we draw the conclusion from our triangulation method that curiosity is driving motivation that is contingent upon sufficient levels of autonomy.

5.1.2 Meritocracy

A behaviour, which also shows the complexity of our area of research, is the concept of meritocracy. Our study has shown that meritocracy does exist among IT-developers, what constitutes a merit however is highly variable among individuals. Some regard these in the same way Young does, where proven intelligence is a merit in and of itself. The others side of the scale, which is the hacker ideal, assign merit to actual code delivered. In our interviews we have observed the entire spectrum.

5.2 Second order analysis

In this section we will relate our finding to the deeper question of how the hacker and developer relate to one another within their community of practice. Furthermore we will consider the evolution of the worker as it relates to the developer and / or hacker.

5.2.1 Guilds 2.0

By staying in front of their computers and working with issues on which just a few has the proper expertise the hackers has in a way isolated themselves from the norms and expectations of their surroundings, building their own geographically dislocated, but ideologically integrated culture. With the anonymity provided by the endless firewalls between them and the rest of the world they have grown up in an arena where the possibilities have been limited only by the technology they operate. The technology has set the borders of their freedom to operate, not the norms of human society.

In our research we have, when exploring the hacker subculture defined an extended community of practice encompassing an array of particularities, which may apply to the modern IT-developer. The hacker, when defined as an individual subscribing entirely to the culture described thus stands apart from all but the most hacker-minded developers. He is, by definition perfectly autonomous and stands as an ethos-carrying ideal for the entire culture however real he may or may not be.

The upshot of this is that the hacker ideal, as described by Levy is more akin to a hero of ancient mythology. He is not observable in any one person in reality but is rather a representation of individual pursuits over a period of time that have been recorded for posterity. In a sense, what Levy wrote was a bible.

As our interviewees take a stand against defining themselves as hackers but still exhibit a number of behaviours in common with the hacker in the literature, we find it to be of essence to define the term “hacker mindedness”. This term should be regarded as being in possession of mental faculties in accordance with the extreme set exhibited by the hacker. That is, extreme curiosity, the need for autonomy and a dislike for authority. One must

though acknowledge that one can be more or less hacker minded and there by exhibit these behaviour to a greater or lesser degree.

The hacker, as a mental frame, should be regarded as living his online life according to a social contract different from the one subscribed to by society at large. Satisfying curiosity is traditionally seen as an end to which any means may be justified. The meritocratic structure of traditional hacker society serves to police the community using ridicule and exclusion and thus purging those who do not share the hacker's burning enthusiasm.

When dwelling on the topic of freedom, one must therefore consider the positive type of freedom. Hacker society seem to be quite resistant to having restrictions imposed upon it and are in possession of the technological means to effect this. The hacker community can hence be regarded as a guild akin to what was common in the Middle Ages with their own criteria for inclusion and means to defend themselves against outside influences.

This guild like autonomic structure has over time given rise to a plethora of commonly held resources, both in terms of knowledge but also in the form of actual software. Being in possession of such resources allows it to retain its autonomy even in light of commercial alternatives. In this way it certainly attains a structure with a multitude of interwoven networks with no centralised nodes.

To take this metaphor further, we consider a guild of tailors with practitioners spread around a city. These tailors all have a set of differing patterns that may be combined in multiple ways to create magnificent clothing. A similar pattern of creativity can be found within the open source community, where programmers competent in different languages collaborate within the community to create free software. Or as this relates to Searle's theories of collective intention, create something together by way of several individual tasks.

5.2.2 Degeneration or evolution

Considering the guild of developers, or hackers, it has historically been protected by barriers to entry in forms of the technological knowledge one had to possess in order to

even begin exploring this area. As computers have become every man's property though, we see that deviations from the traditional model for learning are becoming more common. Now just about anyone from the IT-savvy generation can learn the necessary skills to make a living form programming without subscribing to the cultural baggage.

As we have seen several sides of this phenomenon we infer that the hacker-minded developer still represent an elite within the developer community. That is someone to call on for his unconventional skills, acquired through a long running experimentation based in a curiosity for the technology. He is though, replaceable for more routine developing tasks as inferred from our interviews.

Herein we find that as development skills become more of a commodity than a specialization only possessed by a select few, there is a possibility that employers will chose not to put up with the particularities of the hacker-minded developer. Managing them more among the lines of an exploitable commodity is certainly a possibility if they become more and more replaceable.

When applying Blauner's utopia, although the knowledge worker is by all accounts on the rising right hand side of the inverted bell curve, the hacker may actually be found to the left. If this is the case, he is a representative for a former monopoly on knowledge, which is now being subjected to competition. This relation is by its nature very complex and Blauner's idea represents a simplification of the forces at work. As Braverman infers, this seems to be part of a cyclic behaviour dependent on technological development.

When considering Benkler's global creative communities we might infer a similar path of evolution for their participants, and for society as a whole. Certainly, as the tools for digital creation become available to people in general, one would argue that everyone gains some freedom, and further claim that the knowledge levels in society are raised. It then follows that expertise becomes harder to identify and that the status is lost among the plethora of more or less technologically savvy population. This might represent a risk for an employer, then again, so might hiring an extremely hacker minded individual. This might however lead to the hacker, out of necessity, working harder and exploring deeper

in order to be seen, something that might be positive for both himself and the community as a whole.

If the work performed by developers is allowed to degenerate into mass production as the necessary skills for development become available to the general public. Like professionals building a factory only to see themselves usurped by the capitalists, the developer's role, born from the hacker's autonomy and curiosity, runs the risk of being swallowed by taylorist logic. As the patterns for development accumulate and are analysed, the process might be rationalised into a monotonous assembly line. It then follows that the one who formulates analyses the pattern and formulates the steps would become the taylorist factory owner of the IT age.

One might thus conclude that the hacker mentality is at a crossroads. The hacker-minded developer may join that mainstream, giving up some of his quirks and perhaps losing part of his autonomy for exploration. He thus runs the risk of cementing himself into this mainstream and may slip away from the community of which he was once part. On the other hand, he may have the option of specialising further and through his narrow but extremely thorough knowledge may motivate the autonomy he has become accustomed to. This might, on the other hand, lead to trouble were he to be replaced by someone more socially adapted. The lower threshold seems to lead to some dissonance among hacker-minded individuals.

Concerns have been voiced over the development where managers and colleagues do not speak the language of the developers any more. This might be indicative of a development where the commodity programmer is on the rise; the hacker minded developers thus feel sidestepped. One could though argue that he brought it upon himself.

5.3 Conclusions

Our conclusion is that there is a fine line between autonomy and interdependence, openness and secrecy and freedom and following corporate culture. An IT-developer must not be disturbed in his creative process but in many cases should not be allowed to obfuscate the process. In summary, a manager is not able to press the issue of interdependence to the same extent as with other knowledge workers.

In addition to motivation and interdependence, curiosity is an important motivator specific for IT-developers. As such it must be considered when recruiting new developers where one would ideally seek personality types that exhibit a large degree of curiosity.

IT-developers are part of an extended community of practice that is fundamentally based on hacker culture. As such they have the possibility to draw on resources accumulated over years of experimentation with technology. This community has the characteristics of a guild in that it manages its own resources and polices its borders.

Commodity programmers, who do not share the same cultural connections, are challenging the role of the hacker-minded developer. There therefore exists a possibility that the role of the developer might degenerate into becoming a cog in a mass-producing machine. The hacker has the option of distancing himself from his community and joining the mainstream, thereby losing some of his autonomy. He may also specialise further in order to keep his autonomy even if he may be at risk for unemployment.

5.4 Recommendations

The area of research is complex one. We believe that the following suggestions might provide further insights into select sections.

We believe that the statistical model we have adopted could be further explored. We recommend that a future researcher build and SEM model based on these constructs. This would allow for determination of causality.

As there seems to be a gap between hackers and the developers we have spoken to, we recommend that a further study might identify actual hackers who also work as IT-developers and perform the research from this angle instead.

A study on man-machine interaction might be better able to establish the shapers of hacker culture. Such a study might explain if the machines shape their users' behaviours or if certain types of personality gravitate towards the machine.

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Appendix 2 – Survey questions

A2.1 – Questions asked

Autonomy

Hur mycket ansvar har du för...

PROD1. Att lösa produkt- eller tjänstproblem. (Beyerlein et al. 1993, in Janz& Colquitt 1997)
PROD2. Att ge förslag på nya produkter eller tjänster. (Beyerlein et al. 1993, in Janz & Colquitt 1997)

PLAN1. Att schemalägga ditt eget arbete. (Beyerlein et al. 1993, in Janz & Colquitt 1997)
PLAN2. Att bestämma över dina egna upplärningsbehov. (Beyerlein et al. 1993, in Janz & Colquitt 1997)

PROC1. Att bestämma lämpliga procedurer för att säkerställa ett systems kvalitet. (Janz & Colquitt 1997)

I vilken utsträckning håller du med om följande påståenden?

PPL1. Jag får bestämma över vilka kollegor jag arbetar med.(adapted from Beyerlein et al. 1993, in Janz & Colquitt 1997
AUT.Jag har ett visst mått av kontroll över var jag gör på min arbetsplats. (Huang 2011)

Intedependence
I vilken utsträckning håller du med om följande påståenden.

Outcome interdependence

OI1. Det är fördelaktigt för mig om mina medarbetare uppnår sina arbetsrelaterade mål. (Van der Vegt et al. 1998, in Lin 2010)
OI2. De arbetsrelaterade saker som såväl jag som mina medarbetare vill uppnå är kompatibla. (Van der Vegt al. 1998, in Lin 2010)
OI3: Det är fördelaktigt för mig när mina medarbetare lyckas med sitt arbete. (Van der Vegt et al. 1998, in Lin 2010)

Task Interdependence

TI1. Mina medarbetare är beroende av att jag ger dem information (eller råd). (Van der Vegt et al. 1998, in Lin 2010)
TI2. Mina medarbetare är beroende av att jag ger dem stöd (eller hjälp). (Van der Vegt et al., 1998, in Lin 2010)
TI3. Jag är beroende av mina medarbetare för att utföra mitt arbete väl. (Van der Vegt et al. 1998, in Lin 2010)

Expressiveness interdependence

EI1. Jag är personligen bekant med mina medarbetare. (Lin 2007, in Lin 2010)
EI2. Jag talar om saker utöver arbetet med mina medarbetare. (Lin 2007, in Lin 2010)

Motivation

IM1: Mitt självförtroende stiger när jag gör bra ifrån mig på arbetet. (Janz 1997

SIG: Misstag i mitt arbete skulle kunna få svåra konsekvenser. (Huang 2011)

LM1: Jag kan lära mig nya saker via mitt arbete. (Huang 2011)
LM2: Mitt arbete kräver kontinuerlig uppdatering av min professonella kunskap. (Huang 2011)

Curiosity and Openness

INF&FRM1. Jag ser till att lära mig mer om min arbetsplats än vad mina uppgifter kräver. (Harrison 2009)
INF&FRM2: Generellt sett tycker jag att all information ska vara fritt tillgänglig. (Authors)
INF&FRM3. Jag försöker att se en jobbig situation om en utmaning snarare än ett problem. (Harrison 2009)

DC1. Svåra konceptuella problem kan hålla mig vaken hela nätter tänkandes på en lösning. (Harrison 2009)
DC2. Jag arbetar utan avbrott med problem som jag känner måste lösas. (Harrison 2009)
DC3. Jag brinner för att utforska nya idéer (Authors)
DC4. Jag tycker om att lära mig om saker som jag inte är bekant med. (Harrison 2009)

A2.2 – Original questions

Interdependence

To what degree do you agree that the following describe your behaviour at work?

Outcome interdependence

OI1:It benefits me when my co-workers attain their goals. (Van der Vegt et al. 1998, in Lin 2010)
OI2:The things my co-workers want to accomplish and the things I want to accomplish are compatible. (Van der Vegt al. 1998, in Lin 2010)
OI3: It is advantageous for me when my co-workers succeed in their jobs. (Van der Vegt et al. 1998, in Lin 2010)

Task Interdependence

TI1: My co-workers depend on me for information (or advice). (Van der Vegt et al. 1998, in Lin 2010)
TI2:My co-workers depend on me for support (or help). (Van der Vegt et al., 1998, in Lin

2010)
TI3:I depend on my co-workers to do my job well. (Van der Vegt et al. 1998, in Lin 2010)

Expressiveness interdependence

EI1:I am personally acquainted with my co-workers. (Lin 2007, in Lin 2010)
EI2:I talk about things beyond work with my co-workers. (Lin 2007, in Lin 2010)

Autonomy

How much responsibility do you have for…

PROD1:Solving product or service problems. (Beyerlein et al. 1993, in Janz & Colquitt 1997)
PROD2:Suggest new product or service ideas. (Beyerlein et al. 1993, in Janz & Colquitt 1997)

PLAN1:Schedule your own work. (Beyerlein et al. 1993, in Janz & Colquitt 1997)
PLAN2:Determine your own training needs. (Beyerlein et al. 1993, in Janz & Colquitt 1997)

PROC1. Determine appropriate system quality assurance procedures. (Janz & Colquitt 1997)

To what degree do you agree with the following?

PPL1. I get to decide who I work with. (adapted from Beyerlein et al. 1993, in Janz& Colquitt 1997
AUT. I have a certain amount of control of what I do at work. (Huang 2011)

Motivation

IM2: My opinion of myself goes up when I do my job well. (Janz & Colquitt 1997)

SIG: Mistakes in my job could have serious consequences. (Huang 2011)

LM1: I can learn new things in my job. (Huang 2011)
LM2: My job needs continuous updating of my professional knowledge. (Huang 2011)

Curiosity

INF&FRM1.I make sure to learn about my workplace than required to do my job. (Harrison 2009)
INF&FRM2Generally I think information should be freely available. (Authors)
INF&FRM3.I try to see a tough situation as a challenge rather than as a problem. (Harrison 2009)

DC1. Difficult conceptual problems can keep me awake all night thinking about a solution. (Harrison 2009)
DC2. I work as a fiend on problems I feel need to be solved. (Harrison 2009)

DC3. I am passionate about exploring new ideas (Authors)
DC4. I enjoy learning about subjects that are unfamiliar to me. (Harrison 2009)

Appendix 3 – Interview guide

Typical questions in an interview. Questions were formulated and skipped on the fly.

Intro berätta om företaget

Prata lite om

Frihet

Produktivitet

Frihet

Kommunikation

Hackers

Upphovsrätt?
Ideal

Idoler i din arbetsroll

Tema motivation

Vad motiverar dig?

Hur motiverar du andra?

Tema Beroende

Hur beroende är ni av varandra

Vad händer när beroendet inte stämmer överens?

Övrigt

Efter vilka kriterier bedömer ni personer?

Är det viktigt att du kan försvara en lösning för dig själv.

Tror du att hur du argumenterar främst med argument som du medvetet förstår?